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Near-Infrared Spectroscopy of African Tribal Masks

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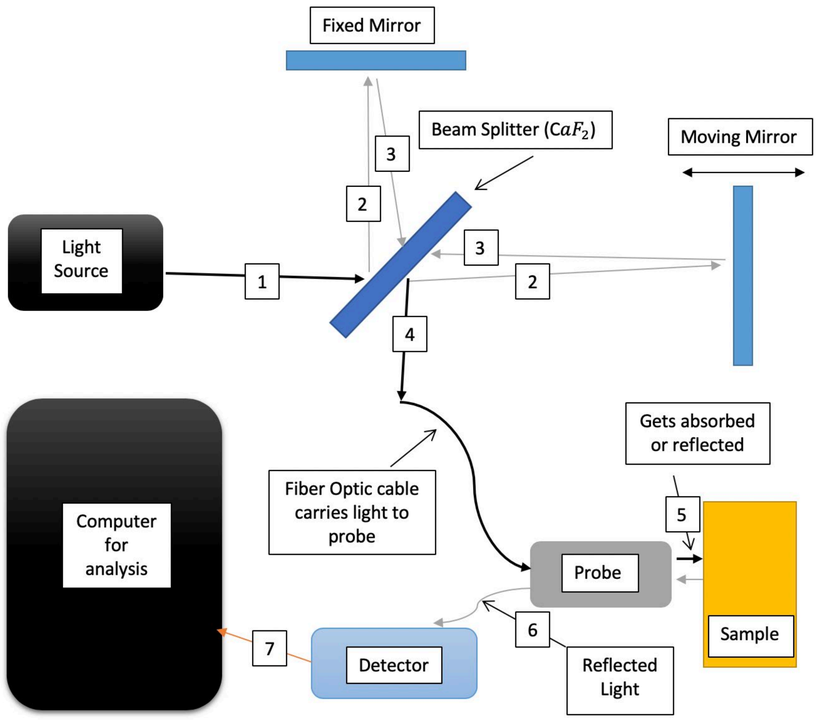
Introduction

- The African Masks are used by the African tribes for rituals and ceremonies.
- The mask is a very important part of what they wear during these special occasions which means they make them with precision and care.
- The masks have been known to be made of many materials but the most common is wood which is what this research revolves around.
- The research was done on five masks and approximately 20 wood samples from the area of the masks.
- The wood samples were mostly from Ghana.
- Many people have been faking these well known African masks for a long period of time and it is difficult to tell them apart, therefore a method to prove these masks are real or fake needs to be found.
- Previously, experts would normally go by the characteristics and the looks of the masks which is how they would tell whether they are real or fake.
- These masks were usually decorated with different pigments and features to give them a unique look.
- They were then suspended over a fire to ensure that the pigments are well engrained into the wood.

Objectives

- Determine whether or not the mask is fake or real
- Analyze the wood samples to compare to the masks that were provided
- Determine what materials the wood masks are made of
- Ultimately find a stable technique to determine whether the mask is real or fake

Instrumentation

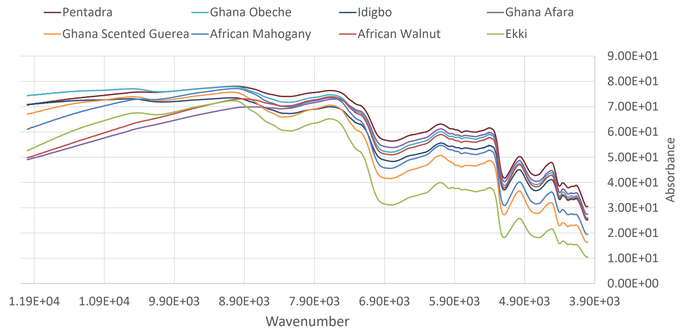


1. Light source sends light to beam splitter
2. Light reflects off and goes to fixed mirror or goes through and hits moving mirror
3. Light is reflected off of the mirrors and back to the beam splitter
4. Fiber optic cable takes the light to the probe
5. The probe allows the light to come in contact with the sample and either gets reflected or absorbed
6. Reflected light is sent to the detector
7. The detector reads the amount of reflected light to the total light given off and provides a spectrum of the results

Results

1. Pentadra
2. Ghana Obeche
3. Ghana Idigbo
4. Ghana Afara
5. Ghana Scented Guerea
6. Ghana African Mahogany
7. Ghana African Walnut
8. Ghana Ekki

These are a few wood samples and the graph shows the IR spectra of these and how they do not all correlate to the brightness from the picture.



When going through and correlating the spectra of the wood samples and the spectra of the masks, none of the slopes matched up exactly, so what that told me was that the masks are made of none of the wood samples from that region or that the IR spectra and cannot be used to determine which wood is actually being used in the masks.

Conclusion

- Near IR is not a good choice for a technique when trying to decide whether or not a mask is fake or not
- For comparing and contrasting the known fake to known real mask would be a better use for this method to dig more deeply into what the materials are on the surface and whether or not the materials can be considered to be a piece of evidence from that time period.
- For what research was done the Near IR can not determine whether a mask is fake or real. It can be used to compare many wood samples to where the masks would've came from, but you can't be for certain that someone didn't take materials from that area so that they can pass that test, yet they still are not real.

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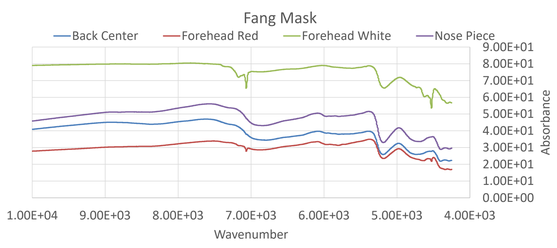
References

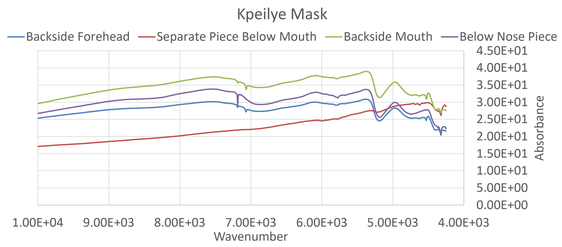
- History of Traditional African Masks. (n.d.). Retrieved September 02, 2018,
- Marzia Varutti (2018) 'Authentic reproductions': museum collection practices as authentication, Museum Management and Curatorship, 33:1, 42-56, DOI:10.1080/09647775.2017.1387589
- The Materials of an African Mask. (n.d.). Retrieved September 08, 2018, from www.artyfactory.com/africanmasks
- Davies, A. (n.d.). An introduction to near infrared (NIR) spectroscopy. Retrieved September 11, 2018, from www.impublications.com

Mask Data

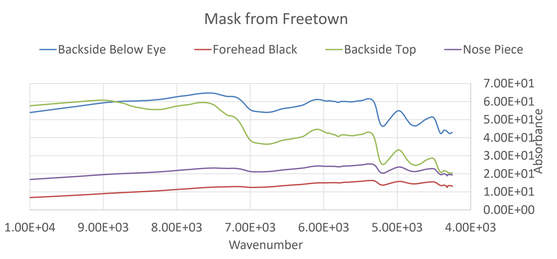
Fang Mask



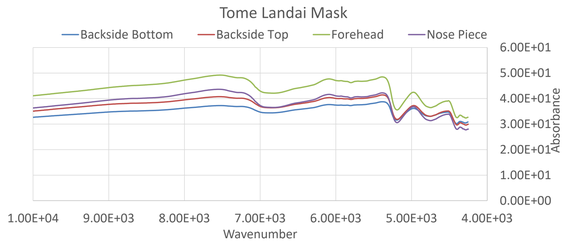
Kpeilye Mask



Mask from Freetown



Tome Landai Mask



These are 5 graphs of the masks and the IR data that they produced. The key part in the graphs is the very left side where you can tell to a certain extent the darkness of woods. In some cases the pigments were used to get an IR spectra, so therefore the slope of the line is different from most of the woods.

Senufo Kpeilye Mask